Nokeval

FT20

User Manual

Contents

Document information 2
Introduction 3
Trademarks 3
Manufacturer 3
Installing 4
Maintenance 8
Firmware settings 9
Operation 13
SCL protocol 14
Modbus protocol 15
Nopsa commands 18
Specifications 22

Document information

Device Scope:	FT20
Device Versions:	1.0 to 1.0
Document Type:	manual
Document ID:	2873
Document Version:	8
Document Date:	3.11.2011

Introduction

FT20 is a radio data receiver and repeater for Nokeval MTR, FTR and KMR series wireless transmitters.

Type FT20-RTC433-RECEIVER means the device is pre-set as receiver only. Type FT20-RTC433-REPEATER means the device is pre-set as repeater and is supplied with a power supply.

FT20 receives and buffers the data packets that wireless transmitters have sent. It can also relay the data packets so that large areas can be covered using only one receiver. It automatically recognizes the types of the transmitters, so different kinds of transmitters can be used simultaneously. Transmitters can also have different transmission intervals. FT20 uses license-free 433.92 MHz frequency band (ISM) so it can be freely used, for example, almost in whole Europe.

FT20 is housed in a watertight (IP 66) and impact resistant plastic enclosure. The joint between the two modules is sealed with two rubber O-rings. The receiver is connected to a computer using RS-485 bus and it requires e.g. PromoLog data acquisition application that reads the data from the device.

Nokeval SCL or Modbus RTU protocol is used for data transmission between the receiver and the computer. Multiple receivers can be connected in parallel to an RS-485 bus to increase the coverage area. FT20 has one diagnostic LED and it requires 8..30 VDC power supply.

Trademarks

This device uses the FreeRTOS real-time operating system version 6.0.5. The source code of the RTOS is available on request – contact support@nokeval.com.

Manufacturer

Nokeval Oy
Yrittäjäkatu 12
FI-37100 Nokia
Finland

Tel +358 3 3424800 (Mo-Fr 8:30-16:00 EET)
WWW http://www.nokeval.com/
email sales@nokeval.com,
support@nokeval.com

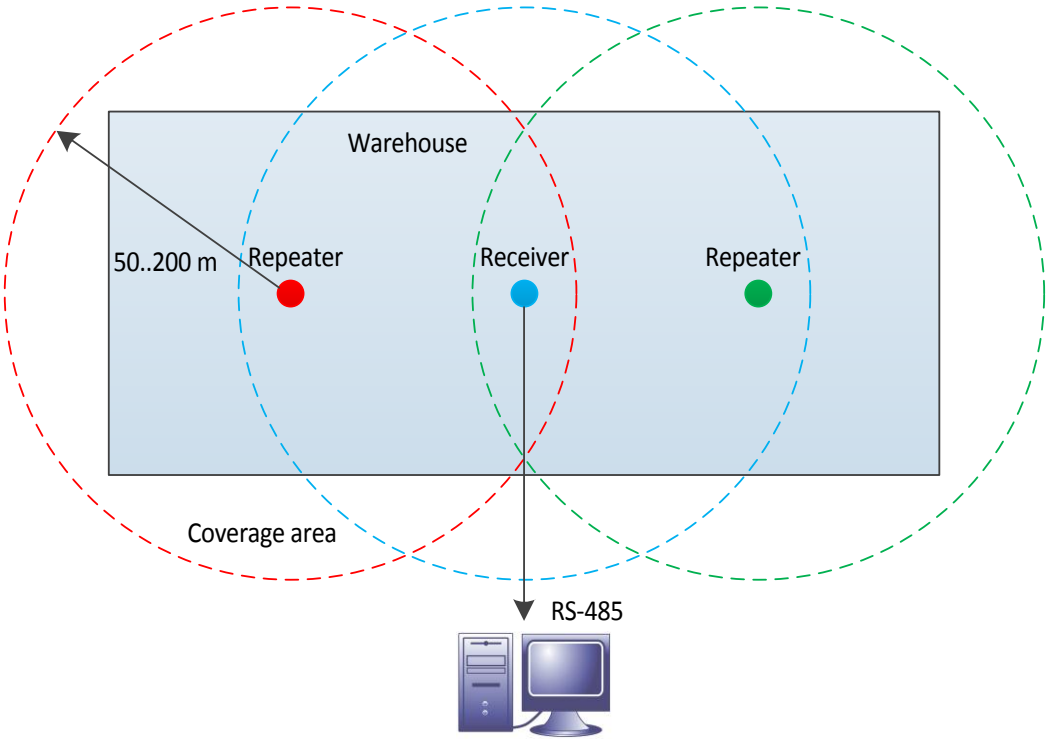
Installing

Mounting

The best installation environment for a radio receiver is above a big grounded horizontal metal surface surrounded by as few as possible vertical metal surfaces. Antenna is to be installed perpendicular to the metal surface. The best range for the transmitter is achieved when there is a line-of-sight from the receiver to the transmitter. Walls and objects between the transmitters attenuate the signal and thereby shorten the range. On the other hand, metal surfaces cause reflections which might lengthen the range.

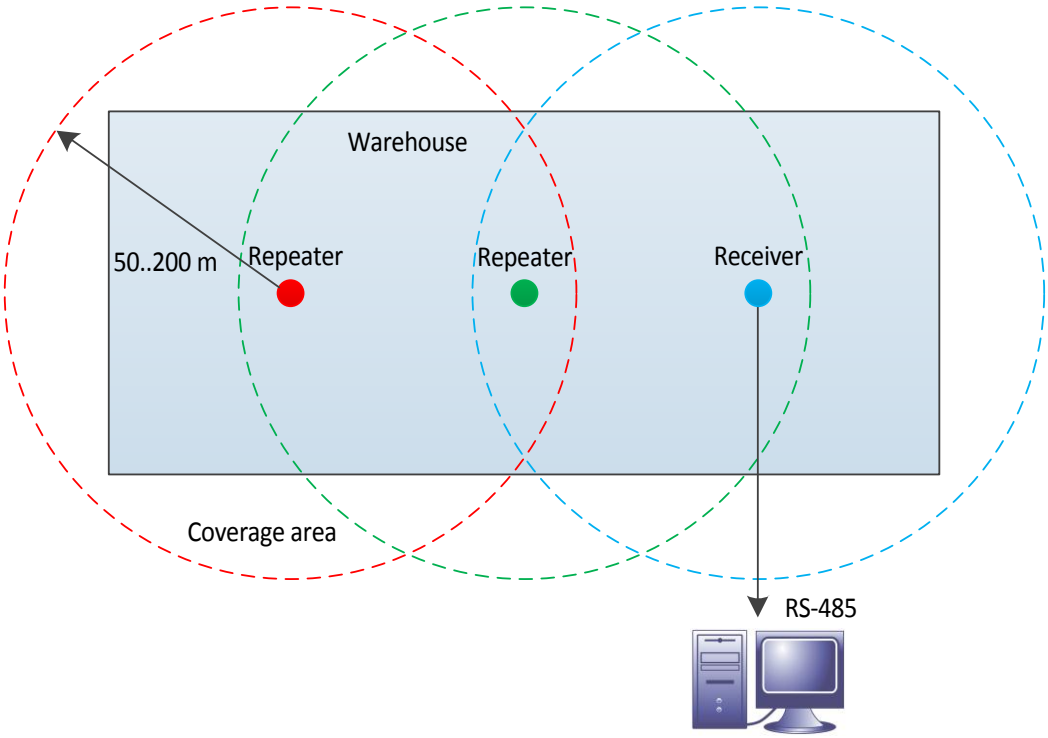
Placing the repeaters

The repeater must be placed in the coverage area of at least one receiver. For example, in the picture below the whole warehouse is covered using two repeaters that are placed near both ends of the warehouse. In this way the receiver that is placed in the center of the warehouse can receive transmissions anywhere from the warehouse.



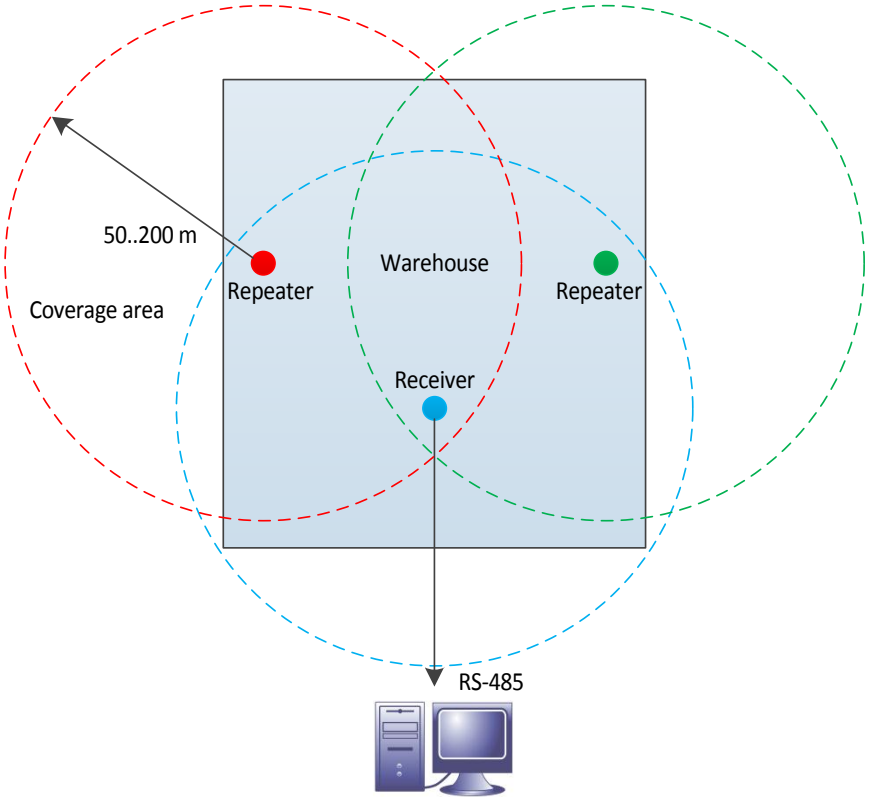
Using two repeaters

The picture below shows how two repeaters can be daisy chained.



The downside of daisy chaining is that now both repeaters relay also the data that they receive from the other repeater. This increases radio traffic and therefore decreases the maximum allowed number of radio transmitters in a coverage area. See the transmitter's manual or example table on page 6 how the use of repeaters affects the maximum number of transmitters.

Both repeaters can be placed in the coverage area of one receiver like in the example picture below.



The maximum number of transmitters

The maximum number of radio transmitters in a coverage area is limited by radio standards. The use of repeaters reduces the maximum number of transmitters because repeaters use the same frequency channel as transmitters. The following example table shows the allowed maximum number of Nokeval radio transmitters in a coverage area.

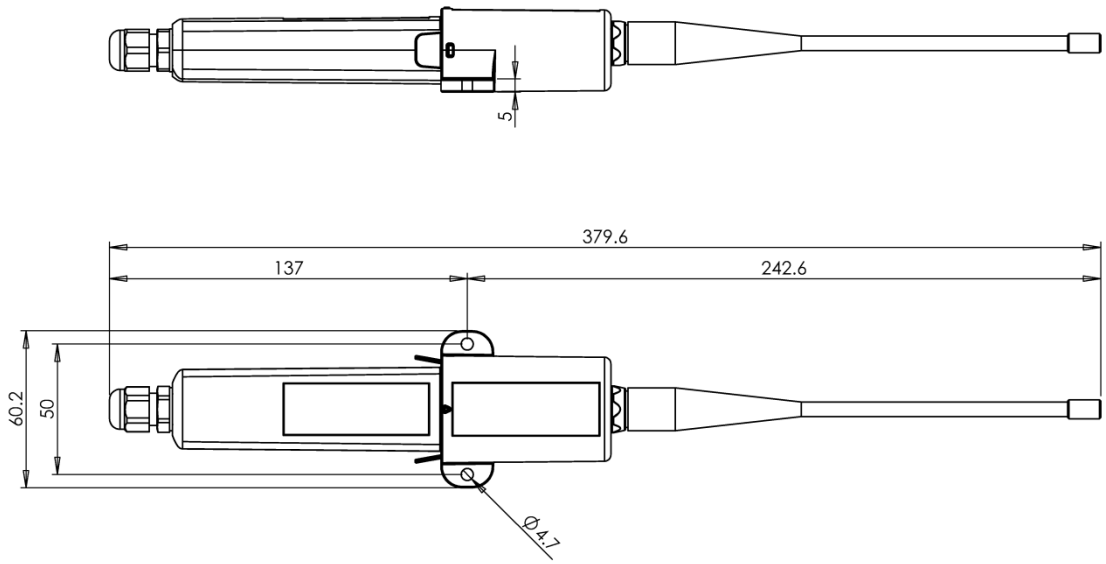
Transmission Interval (s)	Receiver		Receiver and 1 repeater	Receiver and 1 repeater
	Maximum number of transmitters			
5	22		11	7
10	43		22	14
20	87		43*	29
30	130		65	43
40	174		87	58
50	217		109	72
60	261		130	87
70	304		152	101
80	348		174	116
90	391		196	130
120	522		261	174
240	1043		522	348

For example, if you have transmission interval of 20 seconds and one repeater, the maximum number of transmitters is 43*.

Note: ID filter can be used to reduce the radio traffic caused by the repeaters. Using ID filter, only the desired transmitter data packets is repeated (see the section "Firmware settings" sections Repeater/ID filter and Channels/Repeater).

Enclosure

FT20 consists of a radio transceiver module (FT20-RTC433) and a processor/serial module (FT20-RS485). Before use, please make sure that the modules are pushed together all the way so that the locking latches snap into position.



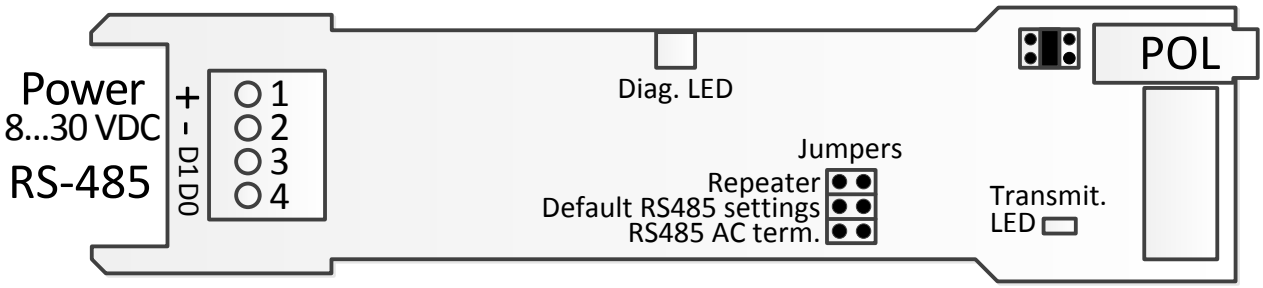
Opening the case

Modules can be detached from each other by pressing the locking latches on the sides of the enclosure and at the same time pulling the modules apart.

For receiver operation the serial module must be opened for RS485 and power cables installation. Serial module can be opened by gently pushing a screwdriver into the slot that holds the cover plate.

When the cover plate is removed, the circuit board can be pulled out of the enclosure.

Connections



FT20 serial module has a 4-pin terminal block for power supply and RS-485 connection. Serial module features also a round 3.5 mm POL programming connector jack found on many other Nokeval products as well. FT20 radio module contains BNC type antenna connector.

Power supply

The supply voltage range is 8...30 VDC and is connected to terminals 1 (+) and 2 (-). Power demand is 50 mA. FT20 is protected against wrong polarity of the supply voltage.

RS-485 serial bus

RS-485 is used when the device operates as a receiver. RS-485 interface can easily be added to a computer by using Nokeval DCS770 or DC771B USB - RS-485 converter or RCS770 USB/RS-232-RS-485 converter. If you use DC771B converter, no external power supply needed (DC771B's power supply should be set to 10V). RS-485 bus is connected to terminals 3 (D1) and 4 (D0). The supply voltage's negative terminal 2 (-) can also use as ground for RS-485.

The RS-485 bus consists of a bidirectional half-duplex twisted data pair and a common wire. The cable should be shielded, the shield earthed at one point. The nominal impedance should be approx. 100-120 Ω.

The length of an RS-485 bus can be up to 1 km and it can be connected to 32 devices, more can be connected via bus repeaters. If the bus is long (say more than 100 m), it is recommended to terminate the first and last device on the bus (set the ”RS485 AC term” jumper to ”on” position).

The polarity of the data pair is important. Modbus specifications call the positive idling line D1, but it is also commonly known as +, B, and A. Correspondingly the negative idling line is -, A, or B.

The bus needs one device that gives a small voltage between the data wires when no device is transmitting on the bus. This is called biasing or fail-safing. The master device is usually the natural choice for biasing.

POL connector

The POL connector is convenient for configuring when the device operates as a repeater. This connector can be used when the modules are disconnected from each other. Note that when the POL plug is connected the RS-485 bus is disabled.

Two types of programming cables are available:

- POL-RS232 for the RS-232 port of the computer.
- DCS772 for the USB port of the computer (recommended).

Antenna

Antenna is connected to the transceiver modules's BNC connector. Antenna is first pushed into the BNC connector by aligning it with two guide posts after which it is turned 90 degrees clockwise. Antenna can be removed by turning it counterclockwise after which the antenna can be pulled off.

Jumpers

FT20 has three jumpers in the serial module: "RS485 AC term" RS-485 termination jumper, default serial settings jumper and jumper which turns repeater on or off (if enabled in firmware settings).

If the device is the last device on the RS485 bus and the bus is long (say more than 100 m), it is recommended to set the "RS485 AC term" jumper to "on" position. When this jumper is set, AC termination is used which means that 1 nF capacitor and 110 ohm resistor are connected in series between the bus wires.

Maintenance

Cleaning

The plastic parts can be cleaned with a soft cloth and soap water. The cloth must be damp but not wet. Cleaning with isopropyl alcohol is also allowed.

Firmware settings

Repeater mode

User does not normally need to setup the device. By default, the device type FT20-RTC433-REPEATER is setup as repeater (repeater jumper is on) and it repeats all the received data packets. In some special cases, for example, when there is lot of transmitters, ID filtering may be needed.

Receiver mode

If you use PromoLog data acquisition software, then there is generally no need to configure the device. Just check that the repeater jumper is off because the repeater mode is not needed and thus prevent the extra radio traffic.

Mekuwin

MekuWin can be used to change settings on various Nokeval products. It has a unique feature: it loads the structure and the contents of the configuration menu from the target device, so the same MekuWin version can be used with past and forthcoming products. There is no need to update this software every time a new product or product version is released. You can download Mekuwin from Nokevals web site for free. Mekuwin has its own instruction manual.

It is also possible to change the configuration settings remotely by writing to the appropriate Modbus Holding registers.

With a POL programming cable

The communications parameters for POL are always:

Protocol	SCL
Baud	9600
Parity	8N1
Address	0

Over the RS-485 serial bus

The Mekuwin communications parameters must match the selections made in the device (Serial menu).

Resetting RS-485 serial communication settings

In case RS-485 serial settings are for some reason not known, they can be temporarily set to defaults by the “default RS485 settings” jumper (shown in the figure on page 7) when the device is powered up.

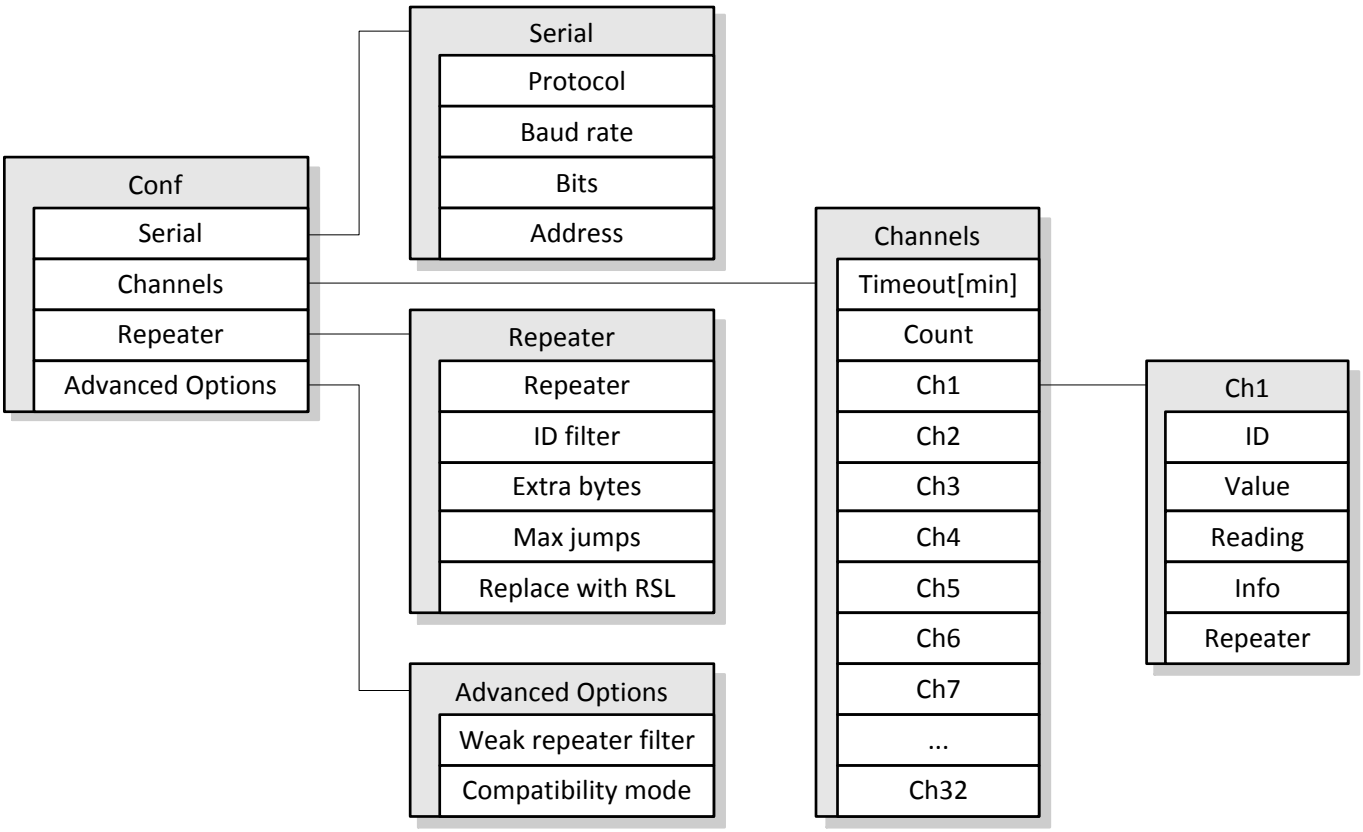
Default communication parameter settings:

Protocol	SCL
Baud	9600
Parity	8N1
Address	0

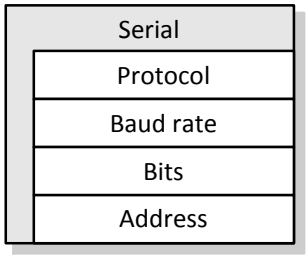
Configuration settings

The configuration settings are arranged as a hierarchical tree: The Conf menu has submenus, and these contain settings and possibly more submenus, etc.

Menu of the FT20:



Serial submenu



Serial communication settings.

Protocol

- SCL: Nokeval SCL protocol. Default.
- Modbus RTU: Modbus RTU protocol

Baud rate

Baud rate selection: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400.
Default 9600.

Bits

Bit selection: 8N1, 8N2, 8E1, 8O1.
Note! SCL protocol uses always 8N1 (this item does not appear when the protocol is SCL). Modbus RTU uses commonly 8E1.

Address

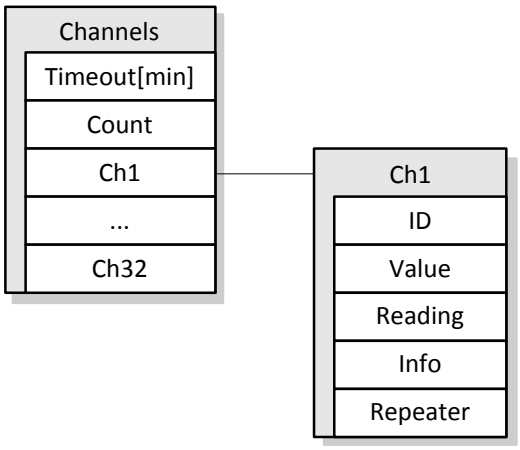
Serial communications address selection. Since several devices can be attached to a bus, each device needs to be configured to a different Address. Valid SCL-addresses are 0...123. Valid Modbus RTU-addresses are 1...247. Default 0.

Channels submenu

Up to 32 channels can be set up in the radio receiver. These channels can be set up to contain any data received from the radio transmitters. The values of these channels can then be queried over the serial interface. This menu contains settings for configuring these channels.

Timeout

The number of how many minutes have to pass since last reception until it is determined that the device is not transmitting anymore and its value is set to NaN (Not a Number). For example if Timeout = 10 min then channel value is set to NaN when more than 10 minutes but less than 11 minutes have passed since last reception.



Count

Sets how many channels are used (0...32).

Ch1 … Ch32

32 MTR series transmitters (for example MTR260 and FT10) can be defined to act as certain channels. For example, when the device receives ”MEA CH 1?” command it sends latest received data from the transmitter that has been assigned to channel one. To assign a device to channel one, set the transmitter's ID to Ch1 ID value. Other channels can be assigned in the same way.

ID

Identification (ID) number of the transmitter (1…65535).

Value

Defines where the contents (reading) of the channel comes from:

- **Input**: Measurement result from the wireless transmitter.
- **TcB**, **TcC**, **TcD**, **TcE**, **TcG**, **TcJ**, **TcK**, **TcL**, **TcN**, **TcR**, **TcS** or, **TcT**: Used thermocouple linearization if transmitter in question can measure temperature with thermocouples but cannot perform the necessary thermocouple linearization by itself.
- **Batt**: Battery voltage of the transmitter.
- **CJ**: Cold junction temperature of the transmitter.
- **RSL**: Received signal level.
- **Interval**: Tells how many seconds between successive receptions from the transmitter.
- **Age**: Tells how many seconds have passed since last reception from the transmitter.
- **Jumps**: The number of repeaters the data from the transmitter has passed through.

Reading

Channel reading.

Info

Shows information on the corresponding transmitter. Signal level, battery voltage, seconds elapsed from the last reception, transmitter type and number of repetitions.

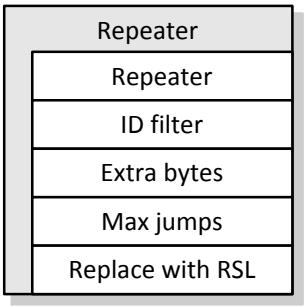
Repeater

If “ID filter” is checked in Repeater submenu, only those IDs will be repeated that have this setting on.

Repeater submenu

Repeater

- Off: Repeater function is off.
- On: Repeater function is on.
- Jumper: Jumper controls the repeater function. Default setting.



ID filter

If checked, only those IDs that are checked in Channels/ChX/Repeater submenu will be repeated. Default unchecked.

Extra bytes

If checked, the device adds additional information to the repeated data packets: Number of hops and the received signal strength. Group of repeaters can deliver received signal level of the weakest link. Default unchecked.

Max jumps

If the “Extra bytes” setting is checked in all repeaters in the system, this setting can limit the number of repeats (jumps) and thus prevent an endless repeating cycle of data packets. Default value 15.

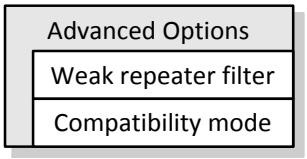
Replace with RSL

This setting is reserved for testing purposes only. When checked, the original measurement value of the repeated data is replaced with the received signal level. Default unchecked.

Advanced Options submenu

Weak repeater filter

When checked, the repeater function will not repeat already repeated data packets that have a received signal level weaker than already received. Default checked.

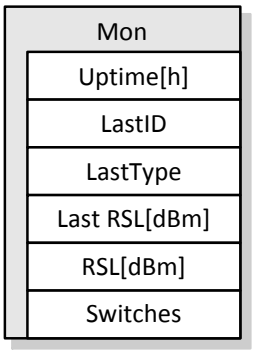


Compatibility mode

When checked, the receiver uses an alternate signal processing algorithm. Try different setting if you have problems with reception in low signal level conditions. Default checked.

Monitor menu

Monitor menu contains some information that can be useful during installation and which may facilitate monitoring the system's operating condition.



Operation

FT20 has one diagnostic LED that shines through the case of the device. This LED blinks slowly when the unit is operational but not receiving any radio data packets at the moment, and blinks rapidly when radio data packets are being received.

Receiver operation

Promolog data acquisition software

PromoLog is a modular data acquisition software allowing you to design customized data collection and monitoring applications matching your needs.

Applications are created by dragging suitable modules from library onto the screen. Both wireless and wired transmitters are supported practically without channel limits. You can also place photos or drawings on the background.

Serial commands

In case PromoLog data acquisition software is not used for reading data from the device, then following protocols can be used to read data from the device:

- Nokeval SCL protocol (page 14).
    - Reading with SCL commands.
    - Reading with Nopsa commands over SCL protocol (page 18).
- Modbus RTU protocol (page 15).
    - Reading Modbus registers.
    - Reading with Nopsa commands over Modbus protocol (page 18).

SCL protocol

A full specification of the Nokeval SCL protocol can be downloaded from Nokeval WWW site. In short, the command frame consists of an address byte (bus address+128), a human-readable command, an ETX character (ASCII 3) and an XOR checksum of all bytes excluding the address byte. A normal response consists of an ACK (ASCII 6), a human-readable response, an ETX and an XOR checksum of all the bytes including the ACK. An error response is similar, but the ACK is replaced by a NAK (ASCII 21).

Nokeval SCL always uses 8N1 parity.

SCL Commands

This device supports the following SCL commands:

TYPE ?

Returns the model name and software version of the device.

SN ?

Returns the device's serial number, for example ”A123456”.

MEA CH <ch> ?

Returns the last received value from the channel <ch>. The response may contain digits 0-9, minus sign, and a decimal point. The scientific representation 1.00E-3 is not used. If the channels result is NaN (Not A Number), device returns ------.

MEA SCAN <first> <last>

Returns the last received values of channels <first> to <last> separated with a space. E.g. MEA SCAN 1 3 will return the values of channels 1, 2, and 3. An example response: 25.6 29.1 0. If the channels result is NaN (Not A Number), device returns ------

DBG 1 ?

Returns the oldest unread data packet from the ring buffer.

DBR 1 <xx> ?

Returns a data packet from the ring buffer at location <xx>.

DBX

Clears the ring buffer (marks all data packets as read).

DBS 1 ?

Returns the size of the ring buffer.

N <hexadecimal data>

Encapsulating a Nopsa command in SCL. The Nopsa command is converted to hexadecimal characters without spaces. E.g. querying the serial number: N 0102. The device responds with hexadecimal characters carrying a Nopsa response. See section “Nopsa commands”.

MN <hexadecimal data>

A legacy command for encapsulating Meku configuration commands in SCL protocol. Using Nopsa is recommended.

Modbus protocol

Supported Modbus RTU commands:

- 3 Read Holding Registers: Read settings.
- 4 Read Input Registers: Read result values.
- 6 Write Single Register: Change settings.
- 16 Write Multiple registers: Change multiple settings at once.
- 17 Report Slave ID: Device type information.
- 109 Meku: This is used by Mekuwin configuration software.
- 110 Nopsa: This is used to transport Nopsa protocol on Modbus.

Command 17 returns 0x11 <byte count> 0x00 0xFF, followed by for example “FT20 V1.0 A123456”

Maximum Modbus packet length is 240 bytes. This affects the maximum possible register count that can be accessed simultaneously with commands 3, 4 and 16.

When settings are changed, the device will save the settings instantly into the configuration EEPROM memory. If serial settings are changed, new settings will take effect only after cycling the device power, it works this way so that all serial settings can be done at once without breaking the serial connection.

Data types:

- BOOL: On/off value. 0=off, 1=on, in lower (right hand side) byte.
- BYTE: 8-bit value. Only lower (right hand side) byte used.
- WORD: 16-bit value.
- ENUM: List of alternatives.
- FLOAT: 32-bit float IEEE 754. Least significant word first, inside word most significant byte first.
- STRINGZ: Zero terminated string. In one Modbus register data is presented as most significant byte first.

Input registers

0..1	Ch1\Reading	FLOAT (LSW, MSB)	Signed
2..3	Ch2\Reading	FLOAT (LSW, MSB)	Signed
…	…		
62..63	Ch32\Reading	FLOAT (LSW, MSB)	Signed
200..201	Ch1\Reading	FLOAT (MSW, MSB)	Signed
202..203	Ch2\Reading	FLOAT (MSW, MSB)	Signed
…	…		
262..263	Ch32\Reading	FLOAT (MSW, MSB)	Signed
400..401	Ch1\Reading	FLOAT (LSW, LSB)	Signed
402..403	Ch2\Reading	FLOAT (LSW, LSB)	Signed
…	…		
462..463	Ch32\Reading	FLOAT (LSW, LSB)	Signed
600..601	Ch1\Reading	FLOAT (MSW, LSB)	Signed
602..603	Ch2\Reading	FLOAT (MSW, LSB)	Signed
…	…		
662..663	Ch32\Reading	FLOAT (MSW, LSB)	Signed
1000	Ch1\Reading	WORD	Signed
1001	Ch2\Reading	WORD	Signed
…	…		
1031	Ch32\Reading	WORD	Signed
2000	Ch1\ID	WORD	Unsigned
2001	Ch1\Type	ENUM	See Table E1
2002	Ch1\Battery	WORD	Unsigned
2003	Ch1\Signal	WORD	Unsigned
2004	Ch1\Flags	WORD	See Table E2
…			

Table E1

Value	Type
0	MTR260
1	MTR262
2	MTR264
3	MTR265
4	MTR165
5	FTR860
6	CSR260
7	Unknown

Table E2

Bits	Bits
0..6	Age counter [min]
7	Data changed

Measured values are available in 4 different word/byte order formats in registers below 1000.
All floats are 32-bit floating point numbers according to IEEE 754.

- In registers 0...63: Least significant word first, inside word most significant byte first.
- In registers 200…263: Most significant word first, inside word most significant byte first.
- In registers 400...463: Least significant word first, inside word least significant byte first.
- In registers 600...663: Most significant word first, inside word least significant byte first.
- In registers 1000...1031 results of channels are presented using fixed point notation with 1 decimal. In example integer 150 means 15.0.

Note! In case the reading is too old (older than the timeout parameter configured in the menu specifies) or there is no reading for a channel then float value is Quiet NaN (0x7FC00000) and word value is 0x7FFF.

Holding registers

Address	Name	Type	Values
2000	Conf\Serial\Protocol	ENUM	See table E3
2001	Conf\Serial\Baud rate	ENUM	See table E4
2002	Conf\Serial\Bits	ENUM	See table E5
2003	Conf\Serial\Address	BYTE	Unsigned 0...247
2004	Conf\Channels\Timeout[min]	BYTE	Unsigned 1...255
2005	Conf\Channels\Count	BYTE	Unsigned 0...32
2006	Conf\Channels\Ch1\ID	WORD	Unsigned
2007	Conf\Channels\Ch1\Value	ENUM	See table E6
2008...2009	Conf\Channels\Ch1\Reading	FLOAT	Signed
2010...2025	Conf\Channels\Ch1\Info	STRINGZ	Len=32
2026	Conf\Channels\Ch1\Repeater	BOOL	
2027	Conf\Channels\Ch2\ID	WORD	Unsigned
2028	Conf\Channels\Ch2\Value	ENUM	See table E6
2029...2030	Conf\Channels\Ch2\Reading	FLOAT	Signed
2031...2046	Conf\Channels\Ch2\Info	STRINGZ	Len=32
2047	Conf\Channels\Ch2\Repeater	BOOL	
...			
2678	Conf\Repeater\Repeater	ENUM	See table E7
2679	Conf\Repeater\ID filter	BOOL	
2680	Conf\Repeater\Extra bytes	BOOL	
2681	Conf\Repeater\Max jumps	BYTE	Unsigned 1...15
2682	Conf\Repeater\Replace with RSL	BOOL	
2683	Conf\Advanced Options\Weak repeater filter	BOOL	
2684	Conf\Advanced Options\Compatibility mode	BOOL	

Enum values

Table E3

Value	Protocol
0	SCL
1	ModbusRTU

Table E4

Value	Baud rate
0	300
1	600
2	1200
3	2400
4	4800
5	9600
6	19200
7	38400
8	57600
9	115200
10	230400

Table E5

Value	Bits
0	8N1
1	8N2
2	8E1
3	8O1

Table E7

Value	Repeater
0	Off
1	On
2	Jumper

Table E6

Value	Value
0	Input
1	TcB
2	TcC
3	TcD
4	TcE
5	TcG
6	TcJ
7	TcK
8	TcL
9	TcN
10	TcR
11	TcS
12	TcT
13	Batt
14	CJ
15	RSL
16	Interval
17	Age
18	Jumps

Nopsa commands

Nopsa is a command language which enables measurement data and configuration data transfer. Nopsa can be used to transfer data between devices or from host to device. Nopsa needs some transfer layer protocol, which takes care of addresses, transfer error management and packet length. This device supports Nopsa commands over either Nokeval SCL or Modbus RTU protocols.

Supported Nopsa commands

- 1/0 (Type) Read device type
- 1/1 (Version) Read device version
- 1/2 (Serial number) Read serial number of the device
- 1/3 (Description) Read short description of the device
- 1/4 (Command set) Read command set number for the device
- 1/5 (Serial buffer size) Read serial buffer size
- 1/7 (Radio ID) Read radio ID
- 1/16 (Reset) Reset device
- 1/32 (Meku) Pass Meku configuration commands to device

- 2/0 (Out value request) Read channel reading
- 2/1 (Out resource request) Read channel metadata (name, data type)

- 4/0 (Buffer info) Read buffer size and current write position
- 4/1 (Find oldest from buffer) Move read position to oldest entry in buffer
- 4/2 (Find newest from buffer) Move read position to newest entry in buffer
- 4/3 (Read buffer with index) Read specific data entry from buffer
- 4/4 (Read next from buffer) Read data entry from buffer and move read position to next
- 4/5 (Reread last) Returns last read operation contents

- 7/10 (Carrier) Turn carrier on or off.
- 7/11 (Test packet) Send RF test packet

Transport protocol SCL

When Nopsa packets are transported on SCL data is converted to hexadecimal notation (0-9 and A-F). One Nopsa byte will become 2 bytes. No spaces between characters. Packet starts with SCL command N and a space.

```
ID 'N' ' ' Nopsa-packet in hexadecimal ETX BCC
```

Response is transferred also same way in hexadecimal, but N command is not appended.

```
ACK Nopsa-response in hexadecimal ETX BCC
```

Transport protocol Modbus RTU

Command function 110 (0x6E) is reserved for Nopsa commands in Modbus free command area. After function code there is one byte which informs Nopsa packet length.

```
ID 0x6E Length Nopsa-packet CRC
```

Response is in same format.

```
0x6E Length Nopsa-packet CRC
```

Nopsa response

Each response contains first status byte.

Bit	Description
.7	Internal error. Device has detected some internal malfunction. In example flash memory don't respond. More detailed error information need to be request by Meku Diag.
.6	External error. Device has detected some external error. More detailed error information need to be requested by Meku Diag.
.2-.0	Command progress: * 0 = OK * 1 = Command is not supported * 2 = Parameter error * 3 = Device is unable to process the command at the moment (busy) * 4 = Command is legal, but some error caused it to fail

If response is not OK, then the response data is not response for the command. Command specific data begins immediately after status byte.

Nopsa command group 1 – Basic commands

	Command	Response
1/0 (Type)	0x01 | 0x00	status | string
string: Device type as string -> FT20		

	Command	Response
1/1 (Version)	0x01 | 0x01	status | string
string: Device version as string -> V1.0		

	Command	Response
1/2 (Serial number)	0x01 | 0x02	status | string
string: Device serial number as string -> A123456		

	Command	Response
1/3 (Description)	0x01 | 0x03	status | string
string: Device description as string -> “Wireless data receiver and repeater”		

	Command	Response
1/4 (Command set)	0x01 | 0x04	status | set*4 *(*4 means 4 bytes)
Set: Informs which Nopsa command set device implements. Command sets are described in another document.		

	Command	Response
1/5 (Serial buffer size)	0x01 | 0x05	status | size
size: Informs serial buffer size of the device		

	Command	Response
1/16 (Reset)	0x01 | 0x10	No response
Device resets immediately after command and don’t response for it.		

	Command	Response
1/32 (Meku)	0x01 | 0x20 | Meku command	status | Meku response
Command used by Mekuwin configuration software		

	Command	Response
1/7 (Radio ID)	0x01 | 0x07	status | id*2
id: Device radio ID.		

Nopsa command group 2 – Data commands

	Command	Response
2/0 (value request)	0x02 | 0x00 | number	status | type | data*4
number: Channel number 0..31, type: 4 (FLOAT), data: float IEEE754		

	Command	Response
2/1 (resource request)	0x02 | 0x01 | number	status | types | flags | name*n
number: Channel number 0..31, types: 4 (FLOAT), flags:0, name: Ch1..Ch32		

Nopsa command group 4 – Logger commands

Real-time data buffer commands

	Command	Response
4/0 (Buffer info)	0x04 | 0x00	status | size*2 | write position*2
size: Ring buffer size (96), write position: position next to be written		

	Command	Response
4/1 (Find oldest)	0x04 | 0x01	status | read position*2 | lap counter
read position: position where is oldest data, lap counter: how many times ring buffer has rolled over (0..255)		

	Command	Response
4/2 (Find newest)	0x04 | 0x02	status | read position*2 | lap counter
read position: position where is newest data, lap counter: how many times ring buffer has rolled over (0..255)		

	Command	Response
4/3 (Read buffer with index)	0x04 | 0x03 | index*2	status | index*2 | lap counter | timestamp*4 | id*2 | type | data*n
index: buffer read position lap counter: how many times ring buffer has rolled over (0..255) timestamp: 4-byte timestamp (0) id: data origin type: 32 (STRUCT)		

	Command	Response
4/4 (Read next)	0x04 | 0x04	As in command 4/3
In case of no new data return only status byte		

	Command	Response
4/5 (Reread last)	0x04 | 0x05	As in command 4/3
Return data which was read last. This has its uses when serial communication error happens.		

Data structure

Data structure in buffer is following

Data type STRUCT		
Struct type	0	Raw radio data packet
Device type	1 byte	
Signal strength	1 byte	Subtract 127 to get result in dBm.
Bytes + battery	1 byte	3 msb data bytes, 5 lsb battery voltage. Divide battery by 10 to get result in volts.
Data bytes	0-7 bytes	Information is dependent on device type.

Table for possible device types

Type	Value
MTR260	0
MTR262/FTR262	2
MTR264	4
MTR265	5
MTR165	6
FTR860	7
CSR264S	8
CSR264L	9
CSR264A	10
CSR260	11
KMR260	12

Specifications

Radio

Antenna Connector	50 Ω BNC female connector
Antenna	Whip antenna
Max input power	+10 dBm
Frequency band	license free 433.92MHz ERC/REC 70-03 sub channel f (sub channel e in older specs)
Ring buffer memory	96 latest transmissions

RS-485 serial connection

Connector	4-pin terminal block combined with power supply, terminal 3 D1, terminal 4 D0. Maximum cable length is 1000 m
Protocol	Nokeval SCL, Modbus RTU, Nopsa
Baud rates	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bits/s
Modbus parity	8N1, 8N2, 8E1, 8O1

Power supply

Connector	4-pin terminal block combined with RS-485, terminal 1 +, terminal 2 -.
Voltage	8…30 VDC
Current	50 mA

External Power supply for FT20-RTC433-REPEATER

Input voltage	100…250 VAC
Input frequency	50…60 Hz
Max. input current	150 mA
Insulation class	Class II
AC power plug	Europlug
Enclosure	The power supply is only designed for indoor use and should not come into contact with water or dust.

LEDs

Internal LED	Transmission activity.
Glows through the case	Blinks slowly: Ready for operation Blinks rapidly: Reception activity

Settings

Connection	RS-485 or POL
Protocol	Nokeval SCL-Meku 1
Software	Mekuwin for Windows

Environmental

Operating temperature	-30…+60 °C
Storage temperature	-40…+70 °C
Humidity	max 90 %RH non-condensing
Protection class	IP66

Dimensions

Length	379.6 mm, inc. antenna
Width	60.2 mm
Height	32.5 mm
Weight	123 g

Regulations

EMC immunity	EN 61326
EMC emissions	EN 61326 class B

R&TTE directive
EN 300 220 class 3
EN 300 489
EN 300 339